"Western Treasure -- Deep, Wet Snow"

FEDERAL-STATE COOPERATIVE SNOW SURVEYS AND IRRIGATION WATER FORECASTS

for

MISSOURI and ARKANSAS DRAINAGE BASINS

MAY 1, 1948

By

Division of Irrigation, Soil Conservation Service
United States Department of Agriculture
and
Colorado Agricultural Experiment Station

Data included in this report were obtained by the agencies named above in cooperation with the U. S. Forest Service, National Park Service, State Engineers of Colorado, Wyoming and New Mexico and other Federal, State and local organizations.

WATER SUPPLY OUTLOOK

MISSOURI-ARKANSAS DRAINAGE BASINS

May 1, 1948

The water supply outlook for the Missouri River and its tributaries in Montana remains favorable. Snow water content on practically all snow courses has been above normal throughout the winter season. In Wyoming the discharge of all streams will be average or above but will generally be under the summer of 1947. The discharge of the Shoshone will be as much as and may exceed last year. For the Wind River and its tributaries the summer flow will be considerably less than last year and about normal. Along the lower Bighorn in Wyoming summer flow should be slightly better than average. Snow cover on the headwaters of the North Platte is above normal and snow has covered the ground most of the winter at medium elevations. Summer flow is expected to be a little less than last year. Reservoir Storage on the Platte totals about one-half million acre-feet above May 1, 1947. Soil moisture conditions throughout Wyoming are generally good. In the South Platte drainage the water supply outlook continues favorable but declined slightly during April because of the lack of normal snow accumulation. Reservoir storage is near capacity in many districts. Snow cover on the headwaters of the Arkansas River is above normal and the summer flow is expected to be about the same as the 1947 season.

Missouri River and Tributaries in Montana

From limited snow surveys in Montana May 1, the water supply outlook continues to be favorable. Summer flow in the Missouri River tributaries is expected to be slightly under last year. Exceptions are the Gallatin where the snow cover April 1 was unusually heavy and the Madison where the snow cover on its headwater in Yellowstone Park was below normal. Recent precipitation has been below normal in eastern and central Montana and in the central Montana plains the soil is dry. Stream flow is above normal. The planting season has been somewhat delayed. Reservoir storage is on the average about the same as last year.

Wyoming

Shoshone: Storage in Buffalo Bill reservoir is now 310,000 acre-feet which is slightly above last year and 7 percent above average. The snow water content on the headwaters of the Shoshone as shown by May 1 surveys is 20 inches which is 35 percent above normal but less than a year ago. Precipitation during April has been near average and stream flow is good. Range and crop conditions along this stream are reported as excellent.

Bighorn: The estimates of summer discharge of the Wind River and its tributaries above Riverton are practically unchanged since April 1. For the Wind River at Riverton the April-September discharge is expected to be 475,000 acre feet and

for the Popo Agie at Riverton 400,000 acre-feet. These flow forecasts are near average for the streams. This year's flow will be substantially under the 1947 season because of late spring snows at high elevations on the watershed last year. The flow of the Greybull River will be about 25 percent above average. In the Bighorn mountains snow cover is slightly above normal and tributaries originating here should have a good summer flow. Soil moisture and range conditions at Riverton and adjacent districts are reported as only fair. Storage in Bull Lake and Pilot Butte reservoirs now totals 91,000 acre feet, practically the same as for May 1, 1947. Along the lower Bighorn soil moisture is good and streamflow slightly low at this time.

Sweetwater: Snow conditions on the headwaters of this stream are very similar to a year ago and summer flow should be comparable. Snow water content is 15 percent above normal.

Cheyenne: The outlook for irrigation water supply is excellent. Soil moisture and crop conditions on the Belle Fourche project are very good at this time. Storage in the reservoir is now 162,500 acre-feet as compared to 156,000 on May 1, 1947. Stream flow is currently about one-half of normal.

Powder: From limited snow surveys at high elevations on this stream, the runoff from melting snow should be somewhat better than average but not as much as for 1947.

Tongue: Snow water content at the Big Goose Ranger Station is 25 percent above average for May 1. Recent as well as seasonal precipitation has been very high in the Sheridan district. Soil moisture, range and crop conditions are reported as very good. Storage in the Tongue River reservoir in Montana is 25,000 acre-feet as compared to 9,000 a year ago at this time.

North Platte: On the North Platte headwaters in Colorado and Wyoming the snow water content measured on ten courses May 1 is 84 percent of last year and 98 percent of normal. Because of considerably low snow during the winter months and current high stream flow, the summer flow of this stream is expected to be well above normal but less than for the 1947 season. Soil moisture is good in the valley in Wyoming but in western Nebraska the topsoil is dry. The flow of the North Platte at Saratoga, Wyoming is expected to be 700,000 acre-feet for the April-September period. Storage in the four major reservoirs on the Platte in Wyoming now totals 1,536,000 acre-feet which is substantially above normal and one-half million above a year ago. In Kingsley and Sutherland reservoirs there is now in storage 1,751,000 acre-feet as compared to 1,314,000 on May 1, 1947.

Laramie: The outlook for irrigation water supplies on this stream is excellent. Snow conditions are very similar to this time a year ago. The April-September flow of the Laramie at Jelm should be about 115,000 acre-feet. Because of a deficiency of precipitation during April stream flow is slightly below normal. Wheatland reservoirs now contain 91,000 acre-feet as compared to 36,000 a year ago. Soil moisture conditions in the Wheatland area are reported as good.

South Platte River Basin

Cache la Poudre: The outlook for irrigation water supply on this stream declined slightly during April. There was very little additional snow at high elevations and considerable melting occurred. The summer flow is expected to be

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above average but somewhat less than for the 1947 season. At Cameron Pass snow water content is now 21½ inches as compared to an average of 23½. Conditions are some better on the North Poudre and the Big South. Recent precipitation has been slightly deficient. Soil moisture conditions are good. Reservoir storage is generally the same as last year.

Big Thompson: Snow cover on the headwaters of this stream reflect a condition similar to April 1. Summer flow will be above normal but under last year. Late summer flow will be near average. Recent precipitation has been about normal and soil moisture conditions are good. Storage in Boyd Lake and Lake Loveland is well above last year. In Boyd Lake there is now stored 30,000 acre-feet as compared to 12,000 a year ago.

Saint Vrain: The water content of the snow at Wild Basin is 12 inches as compared to an average of 13. Due to earlier and lower elevation snow the summer flow should be slightly above average but substantially under the 1947 season. April precipitation was deficient. Soil moisture conditions are described as good and stream flow as normal.

Boulder Creek: Snow cover on the headwaters of the Boulder Creeks is above the average, but following the pattern of other South Platte tributaries is below last year. The April-September flow is expected to be 65,000 acre feet. Last year it was 74,000. Recent precipitation and stream flow have been normal or above. Soil moisture conditions are excellent. Barker Meadow reservoir is nearly empty but is expected to fill this season.

Clear Creek: The water supply outlook on this stream improved somewhat during April. Snow water content at Loveland Pass course is now 14.6 inches as compared to an average of 13. Stream flow is above normal and soil moisture and crop conditions are reported as excellent. Reservoir storage is about the same as a year ago and near capacity.

South Platte above Denver: Storage in the Denver Municipal reservoirs in South Park above Denver is now 197,000 acre-feet as compared to 159,000 for a past ten year average. On May 1, 1947, 193,000 acre-feet was stored. Stream flow at Denver is unusually high due to melting of snow in South Park during April. Snow water content measured on snow courses May 1 was 7.7 inches. The average is 5.5 and last year it was 8.5. The summer flow of this stream should equal the 1947 season.

In the lower South Platte Valley in Colorado the water supply outlook is favorable. Soil moisture conditions from Fort Morgan west are very good. Reservoir storage is near capacity and practically the same as a year ago. In the Sterling district, soil moisture, range and crop conditions are described as fair due to recent lack of precipitation. Here reservoirs are also near capacity and the amount of water in storage is similar to May 1, 1947.

The ground-water table in the areas adjacent to the South Platte River rose 1 to 4 feet during the year, the maximum occurring near Gilcrest. Gains were made throughout the Cache La Poudre valley with a maximum of 2 feet near Wellington. There was a general rise in the Lone Tree valley, the greatest being about 2 feet near Eaton. A general rise occurred along Box Elder creek with a maximum of 3 feet near Hudson. A rise of 1 to 7 feet occurred in the Prospect valley being greatest at the south end. The Bijou creek pumping area suffered an average lowering of about 1 feet. In Beaver creek valley there were no important changes except for a lowering of about one foot near Gary.

Arkansas River

The outlook for irrigation water supply in the Arkanasa Valley is excellent. The summer flow of the Arkansas at Salida should be about 450,000 acre-feet or the same as last year. On the tributary streams to the south, the Cucharas and Purgatoire Rivers, prospective summer flow has declined slightly during April. Heavy melting occurred on these streams and stream flow is above normal. On the Arkansas River stream flow has also been above normal. Soil moisture conditions throughout the valley are reported as good except for drying topsoil. At Pueblo April precipitation was normal but elsewhere there were varying amounts of deficiency. On Fountain creek stream flow was normal. Reservoir storage throughout the valley is substantially above the 1947 season and the past ten year average.

The groundwater table in the Arkansas Valley from Pueblo to Fowler generally rose from 1 to 2 feet during the past year. Between Fowler and Rocky Ford very little change occurred. On Fountain Creek the water table a few miles south of Fountain is 4 feet higher while between Fountain and Colorado Springs there was little change from last year.

MISSOURI-ARKANSAS DRAINAGE BASINS

STREAM FLOW FORECASTS, May 1, 1948

Basin and Stream	Apr.-Sept., incl., Streamflow, Acre Feet				
	Forecast	Measured Runoff			10-yr. Avg.
	1948	1947	1946	1945	1937-1946
YELLOWSTONE					
Shoshone below Buffalo-Bill Res.	800,000	757,000	436,000	614,000	675,000
Wind River at Riverton	475,000	753,000	352,000	520,000	456,000
Popo Agie at Riverton	400,000	566,000	333,000	423,000	420,000
NORTH PLATTE					
Sweetwater at Alcova	70,000	85,000	49,000	---	58,300
North Platte at Saratoga	700,000	761,000	510,000	841,600	564,000
Laramie at Jelm	115,000	123,000	91,840	100,660	87,600
SOUTH PLATTE					
Poudre at Canon	275,000	298,000	200,000	253,000	237,000
Big Thompson at Drake	135,000	168,000	67,000	136,000	102,000
St. Vrain at Lyons	90,000	126,000	52,000	88,000	79,000
Boulder at Orodell	65,000	74,000	41,000	51,000	50,700
Clear Creek at Golden	175,000	203,700	---	143,000	142,000
ARKANSAS					
Arkansas at Salida	450,000	451,000	326,000	316,000	322,000
Purgatoire at Trinidad	80,000		16,600	43,000	64,000

STATUS OF RESERVOIR STORAGE, MISSOURI-ARKANSAS BASIN, May 1, 1948

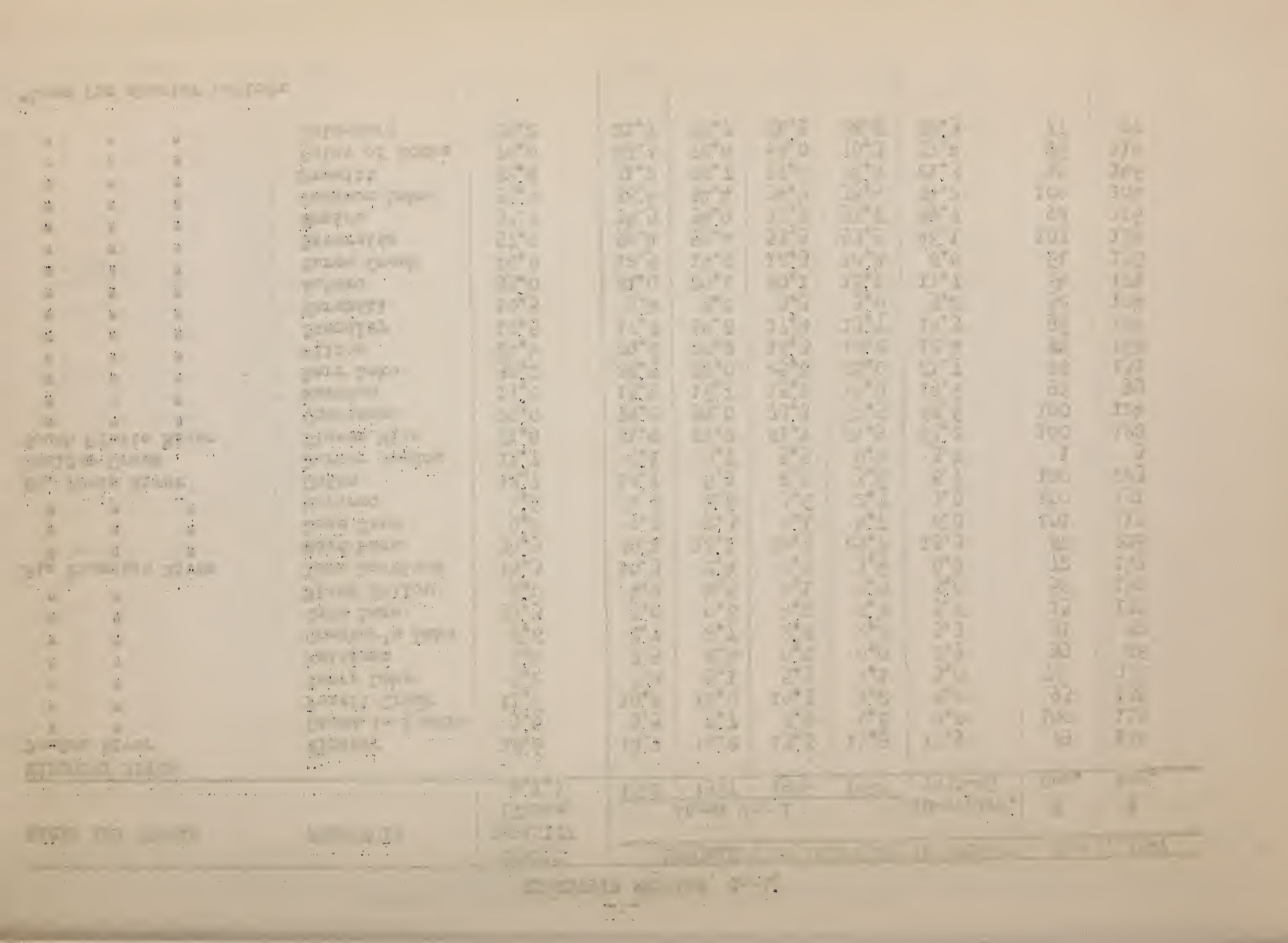
BASIN AND STREAM	RESERVOIR	USABLE CAPACITY (Thous. A.F.)	THOUSANDS OF ACRE FEET IN STORAGE					May 1, 1948	
			About May 1				10-yr. Avg.	%	%
			1948	1947	1946	1945	1937-46	Cap.	Avg.
MISSOURI RIVER									
Missouri River	Fort Peck	19000.0	13790.0	15225.0	13270.0	11440.0	7948.1	73	174
" "	Canon Ferry	37.8	23.7	35.4	36.6	19.2	23.6	63	100
" "	Hauser Lake	52.7	31.4	39.7	42.9	50.2	44.0	60	72
" "	Holter	73.6	51.2	59.5	61.7	47.3	47.3	70	108
" "	Gibson	105.0	71.5	64.6	76.7	71.6	70.8	68	101
" "	Willow Creek	32.4	19.1	16.9	11.6	22.6	9.7	59	197
" "	Pishkun	32.0	20.8	17.2	22.4	17.0	15.8	65	132
Marias River	Four Horns	20.0	7.4	11.8	5.8	5.3	8.2	37	90
" "	Birch Creek	30.0	27.2	28.4	26.3	27.5	21.3	91	128
" "	Lake Francis	112.0	107.9	105.1	103.9	100.7	58.6	96	184
Musselshell River	Deadmans Basin	52.5	—	—	—	50.5	--	—	—
" "	Martinsdale	23.0	—	12.1	9.6	12.1	10.9	—	—
Yellowstone River	Cooney	27.5	10.7	13.4	8.3	13.4	18.1	39	59
Tongue River	Tongue River	73.9	24.9	9.1	18.6	10.1	17.6	34	141
Milk River	Fresno	127.2	131.9	131.0	62.0	50.0	58.3	103	226
" "	Nelson	66.8	33.9	34.7	26.6	37.0	32.2	51	105
St. Marys River	Sherburne	66.0	35.8	17.6	10.7	20.8	19.9	54	180
Gallatin River	Mystic Lake	20.8	2.3	3.3	9.6	3.7	3.1	11	75
Madison River	Madison	41.0	36.4	38.5	37.4	33.8	28.6	89	127
" "	Hebgen	345.0	185.3	179.1	191.7	246.6	255.1	54	73
Jefferson River	Ruby	39.0	—	—	37.5	28.0	30.3	—	—
Cheyenne River	Belle Fourche	177.5	162.6	156.2	151.9	146.2	108.7	92	150
Shoshone River	Buffalo Bill	456.6	309.9	293.8	387.7	258.3	289.6	68	107
Wind River	Pilot Butte	30.0	21.6	20.2	21.6	20.4	21.0	72	103
" "	Bull Lake	155.0	69.4	68.4	52.4	50.6	49.3	45	140
Greybull River	Sunshine	52.0		36.0	37.0				
North Platte River	Kingsley-Sutherland	2180.0	1751.5	1314.0	1280.0	881.6	784.2	81	224
" " "	Minatare	60.8	48.0	54.2	51.5	44.7	33.7	79	142
" " "	Alcova	190.0	166.5	150.4	143.1	124.8	112.9	87	147
" " "	Seminoe	1025.0	646.5	405.3	610.7	145.2	210.0	63	308
" " "	Guernsey	46.0	22.5	41.8	21.9	31.8	40.4	49	56
" " "	Pathfinder	1045.5	700.6	470.4	377.5	292.2	293.4	67	239
Laramie River	Wheatland		90.7		54.0	28.1	33.5	—	270

*Some for shorter periods

RESERVOIR STORAGE, Cont.

BASIN AND STREAM	RESERVOIR	USABLE CAPACITY (Thous. A.F.)	THOUSANDS OF ACRE FEET IN STORAGE, May 1, 1947						
			About May 1				10-yr. Avg.	%	%
			1948	1947	1946	1945	1937-46	Cap.	Avg.
MISSOURI RIVER									
Poudre River	Windsor	18.6	14.7	12.2	13.3	11.9	12.9	79	114
" "	Cache la Poudre	9.5	9.5	8.7	8.9	6.6	8.0	100	119
" "	Fossil Creek	11.6	10.8	11.0	10.3	4.2	8.0	93	135
" "	Terry Lake	8.2	6.1	5.1	5.3	4.1	5.0	75	122
" "	Halligan	6.4	2.5	2.4	0.0	0.0	2.9	39	86
" "	Chamber's Lake	8.8	2.7	2.7	2.8	2.2	3.3	31	82
" "	Cobb Lake	34.3	5.0	0.6	4.2	8.4	3.8	15	132
" "	Black Hollow	8.0	4.2	4.6	4.1	2.0	3.0	52	140
Big Thompson River	Lake Loveland	14.3	10.3	2.4	8.2	3.6	6.9	72	149
" " "	Boyd Lake	34.3	30.1	12.1	24.3	25.7	13.3	88	226
" " "	Lone Tree	9.2	9.3	9.3	8.1	4.7	8.0	101	115
" " "	Mariano	4.6	4.6	4.6	3.6	2.7	3.5	100	131
St. Vrain River	Union	12.7	12.7	6.9	8.2	3.6	5.7	100	223
Boulder Creek	Barker Meadow	11.7	0.1	0.7	5.5	0.4	3.4	1	3
South Platte River	Eleven Mile	81.9	81.9	81.9	81.9	81.9	67.2	100	122
" " "	Cheeseman	79.0	79.0	59.0	73.7	62.5	63.6	100	124
" " "	Marston	17.0	15.5	16.7	15.2	14.9	15.6	91	99
" " "	Barr Lake	32.2	28.5	28.0	25.8	26.0	21.7	88	131
" " "	Milton	24.4	20.8	20.2	16.3	12.2	12.4	85	168
" " "	Standley	18.5	17.8	12.8	17.4	13.7	14.3	96	124
" " "	Marshall	10.3	5.4	5.2	5.3	3.6	5.2	52	104
" " "	Antero	33.0	21.0	20.1	20.1	16.1	11.7	64	179
" " "	Horse Creek	20.6	12.5	14.2	12.3	10.4	8.0	61	156
" " "	Riverside	57.5	59.4	59.4	53.9	53.9	46.1	103	129
" " "	Empire	37.7	34.5	34.9	32.2	33.8	29.7	92	116
" " "	Jackson Lake	35.4	35.4	34.4	34.4	35.4	34.2	100	104
" " "	Prewitt	32.8	31.2	28.7	27.6	26.4	21.3	95	146
" " "	Point of Rocks	70.0	67.3	72.0	67.0	70.3	59.2	96	114
" " "	Julesburg	28.2	21.7	22.7	21.9	22.8	22.3	77	97

*Some for shorter periods



RESERVOIR STORAGE, Cont.

BASIN AND STREAM	RESERVOIR	USABLE CAPACITY (Thous.A.F.)	THOUSANDS OF ACRE FEET IN STORAGE About May 1				10-yr.Avg.	May 1, 1948 %	
			1948	1947	1946	1945	1937-46*	Cap.	Avg.
ARKANSAS									
Arkansas River	Twin Lakes	57.9	38.8	15.2	29.5	14.0	21.7	67	179
" "	Sugar Loaf	17.4	11.1	8.0	10.0	6.1	7.8	64	142
" "	Clear Creek	11.4	8.0	4.4	8.6	7.7	3.9	70	205
" "	Meredith	41.9	31.6	26.7	23.2	33.2	17.9	75	176
" "	Horse Creek	26.9	17.2	16.0	14.0	11.8	9.5	64	181
" "	Adobe Creek	61.6	56.8	38.0	41.0	34.3	23.9	92	238
" "	Cucharas	40.0	20.0	2.4	5.3	10.0	7.9	50	254
" "	Two Buttes	40.9	4.0	7.9	0.3	0.6	12.7	10	31
" "	John Martin	655.0	99.7	64.9	49.9	45.9	49.5	15	201
" "	Great Plains	150.0	132.1	96.3	90.3	118.2	40.0	88	331
Purgatoire River	Model**	6.2	4.3	3.4	3.6	5.0	5.5	69	78

*Some for shorter periods.
**Resurveyed in 1946

SNOW SURVEYS AND IRRIGATION WATER FORECASTS FOR MISSOURI AND ARKANSAS RIVERS
May 1, 1948

PRECIPITATION DATA

WATERSHED	STATE	Precipitation October 1 to April 30	Departure from Normal	Precipitation April*	Departure from Normal
		Inches	Inches	Inches	Inches
Missouri	East. Mont.	4.03	-0.72	1.25	+0.17
Missouri	Cent. Mont.	5.44	-0.31	0.87	-0.40
Missouri	North Wyo.	8.58	+0.97	1.39	-0.35
North Platte	Wyoming	6.09	-0.04	1.08	-0.30
South Platte	Colorado	11.77	+3.20	1.99	-0.34
Arkansas	Colorado	11.41	+3.34	1.30	-0.34

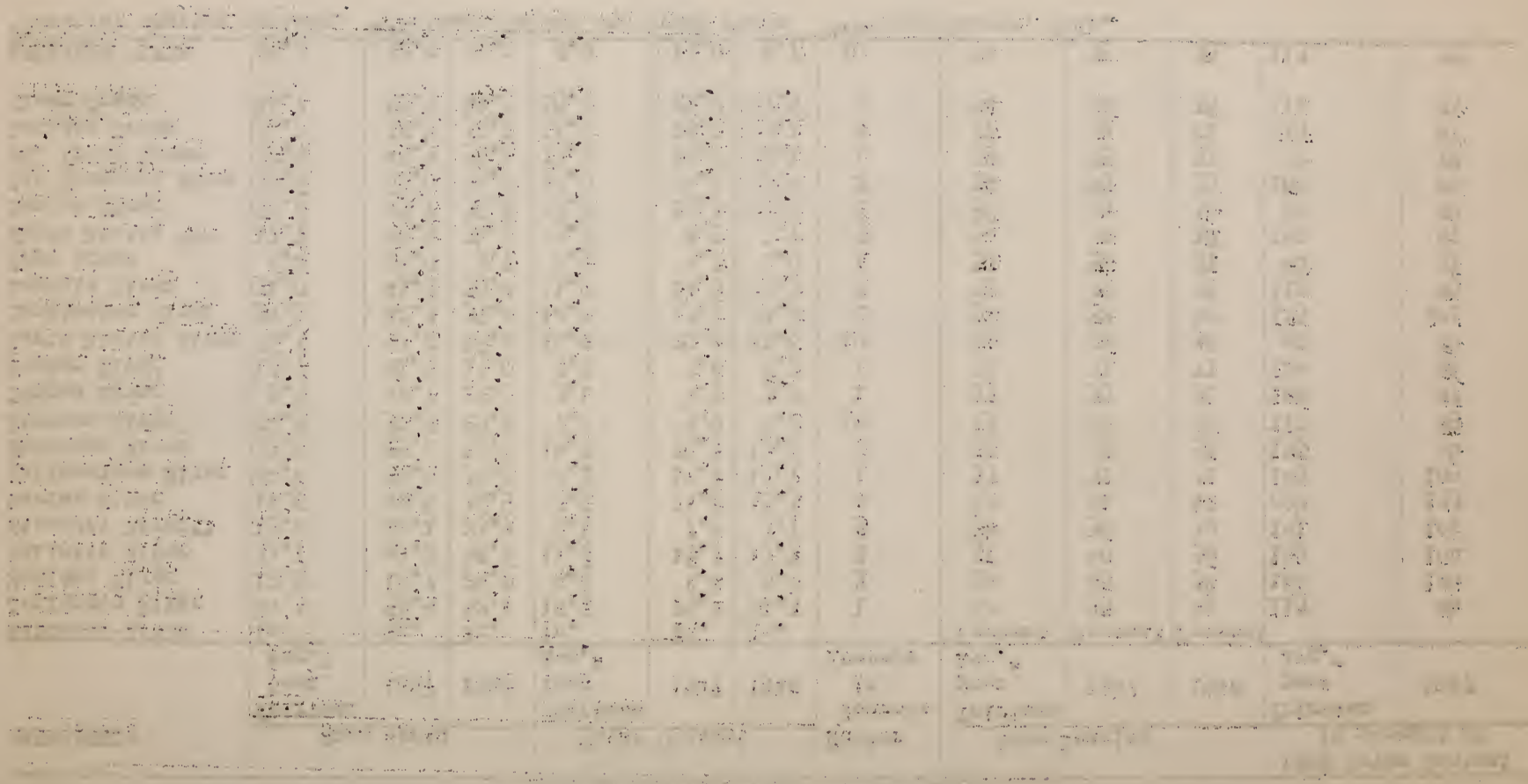
April precipitation was below normal except in central Montana. The accumulated precipitation was above normal except in Montana and in the North Platte in Wyoming.

*April precipitation tentative.

SUMMARY OF MAY 1 SNOW SURVEYS AND COMPARISON OF DATA WITH THAT OF PREVIOUS YEARS BY WATERSHEDS

WATERSHEDS	Snow Depth			Water Content			Number Courses in Average	Snow Density			1948 Water Content in percent of	
	Thirteen Year Avg.*	1947	1948	Thirteen Year Avg.*	1947	1948		Thirteen year Avg.*	1947	1948	Thirteen year Avg.*	1947
MISSOURI RIVER	In.	In.	In.	In.	In.	In.		Percent	Percent	Percent		
Jefferson River	44.3	56.4	52.1	18.5	25.4	21.3	1	42	45	41	115	84
Madison River	12.5	14.7	24.0	4.9	6.6	8.2	3	39	45	34	166	124
Gallatin River	31.7	41.2	48.6	11.6	16.7	17.3	3	37	40	36	149	104
Missouri River**	15.2	21.1	23.9	5.1	7.6	7.7	5	34	36	32	151	101
Marias River	16.5	22.4	36.9	7.5	11.5	15.3	1	45	51	42	204	133
Yellowstone River	24.6	34.4	38.0	8.1	10.7	11.7	1	33	31	31	145	109
Shoshone River	38.9	55.2	52.4	14.7	21.1	19.9	2	38	38	38	135	94
Bighorn River	22.5	30.8	25.2	7.5	9.9	8.8	10	33	32	35	117	89
Tongue River	9.5	12.7	12.5	3.1	4.5	3.9	1	33	35	31	126	87
Powder River	18.7	21.5	17.0	5.5	6.6	6.3	1	29	31	37	114	96
North Platte River	46.3	57.2	46.2	18.0	20.9	17.6	10	39	36	38	98	84
Sweetwater River	34.9	42.3	35.0	12.0	13.7	13.8	2	34	32	40	115	101
Laramie River	31.0	41.2	35.4	11.0	14.5	12.3	8	35	35	35	112	85
Crow Creek	8.2	14.0	2.7	2.5	4.7	1.0	1	30	34	37	40	21
South Platte ***	17.7	26.6	34.1	5.5	8.5	7.7	3	31	32	32	140	91
Poudre River	34.6	43.7	36.6	12.5	15.3	12.2	6	36	35	34	98	80
Big Thompson River	53.6	61.0	52.6	18.0	21.6	18.4	2	34	35	35	102	85
St. Vrain River	37.4	45.4	36.1	13.2	15.6	12.1	1	35	35	33	92	78
Boulder Creek	31.2	38.4	32.1	11.6	15.1	13.1	2	37	39	41	113	87
Clear Creek	46.7	58.5	49.5	15.8	21.2	17.6	2	34	36	36	111	83
ARKANSAS RIVER	25.2	32.0	28.0	8.6	11.0	9.7	10	34	35	35	113	88

*Some for shorter periods. **Between Helena and Great Falls ***Above Denver, Colo.



MISSOURI-ARKANSAS RIVERS SNOW SURVEYS, May 1, 1948

DRAINAGE BASIN and SNOW COURSE	LOCATION					SNOW COURSE MEASUREMENTS						
								Water Content (Inches)				Past Record
	No. and State	Sec.	Twp.	Range	Elev.	Date of Survey	Snow Depth (Inches)	1948	1947	1946	Years of Record	Av. Water Content (Inches)
MISSOURI RIVER												
JEFFERSON RIVER												
East Fork R.S.	7 Mont.	16	2N	17W	5400				0.0	0.0	11	0.0
Gibbons Pass	10 "	4	2S	19W	7100	5/1	52.1	21.3	25.4	17.4	12	18.5
Pipestone Pass	30 "	11	1N	7W	7200					0.0		
Elkhorn Hog Spg	"	15	4S	12W	8450	5/1	29.0	8.8	—	—	6	5.3
Stormlake	"	19	4N	13W	8100				17.9	10.1	12	12.2
	Average for drainage						52.1	21.3	25.4	17.4		18.5
MADISON RIVER												
Aster Creek*	2 Wyo.		44.3N	110.6W	7700				36.8	34.7	11	29.0
Lewis L. Divide*	8 "		44.2N	110.7W	7900				49.6	45.6	12	40.4
West Yellowstone	16 Mont.	34	13S	5E	6700	5/1	13.1	4.5	3.7	1.8	13	2.6
Twenty-one Mile*	"	1	11S	5E	7150	5/1	36.4	12.6	14.6	10.3	13	9.7
Hebgen Dam	"	22	11S	3E	6550	5/1	22.4	7.4	1.6	1.2	12	2.5
	Average for drainage						24.0	8.2	6.6	4.4		4.9
GALLATIN RIVER												
Devil's Slide	Mont.	14	5S	6E	8100	5/1	78.8	30.5	28.2	22.3	13	21.1
Hood Meadow Extn.	"	22	4S	6E	6600	5/1	30.6	9.9	7.3	1.3	13	3.9
Twenty-one Mile	"	1	11S	5E	7150	5/1	36.4	12.6	14.6	10.3	13	9.7
	Average for drainage						48.6	17.3	16.7	11.3		11.6
MISSOURI RIVER**												
Chessman Res.	6 Mont.	2	8N	6W	6200	5/1	12.8	4.6	1.7	0.0	12	1.4
Stemple Pass	36 "	15	13N	7W	6900	5/1	27.0	8.3	7.8	2.0	12	5.4
Lower Rimini	41 "	13	8N	6W	6250	5/1	6.8	2.1	2.1	T	12	1.5
Middle Rimini	42 "	13	8N	6W	6800	5/1	29.4	8.9	11.8	1.4	12	6.4
Upper Rimini	43 "	19	8N	5W	8000	5/1	43.6	14.6	14.6	4.6	12	10.9
	Average for drainage						23.9	7.7	7.6	1.6		5.1
MARIAS RIVER												
Marias Pass	20 Mont.		48.3N	113.4W	5250	5/1	36.9	15.3	11.5	8.8	12	7.5
YELLOWSTONE RIVER												
Canyon	Wyo.		44.7N	110.5W	7750	5/1	36.5	10.8	—	—	2	7.2
Cooke City	10 Mont.	25	9S	14E	7400	5/1	21.8	9.4	—	—	3	5.0
Lake Camp	Wyo.		44.6N	110.4W	7850	5/1	31.6	9.5	—	—	2	6.8
Lodgepole	43 Wyo.	32	56N	106W	8200	4/30	38.0	11.7	10.7	8.3	12	8.1
*On adjacent drainage	Average for drainage						38.0	11.7	10.7	8.3		8.1

MISSOURI-ARKANSAS RIVERS SNOW SURVEYS, May 1, 1948

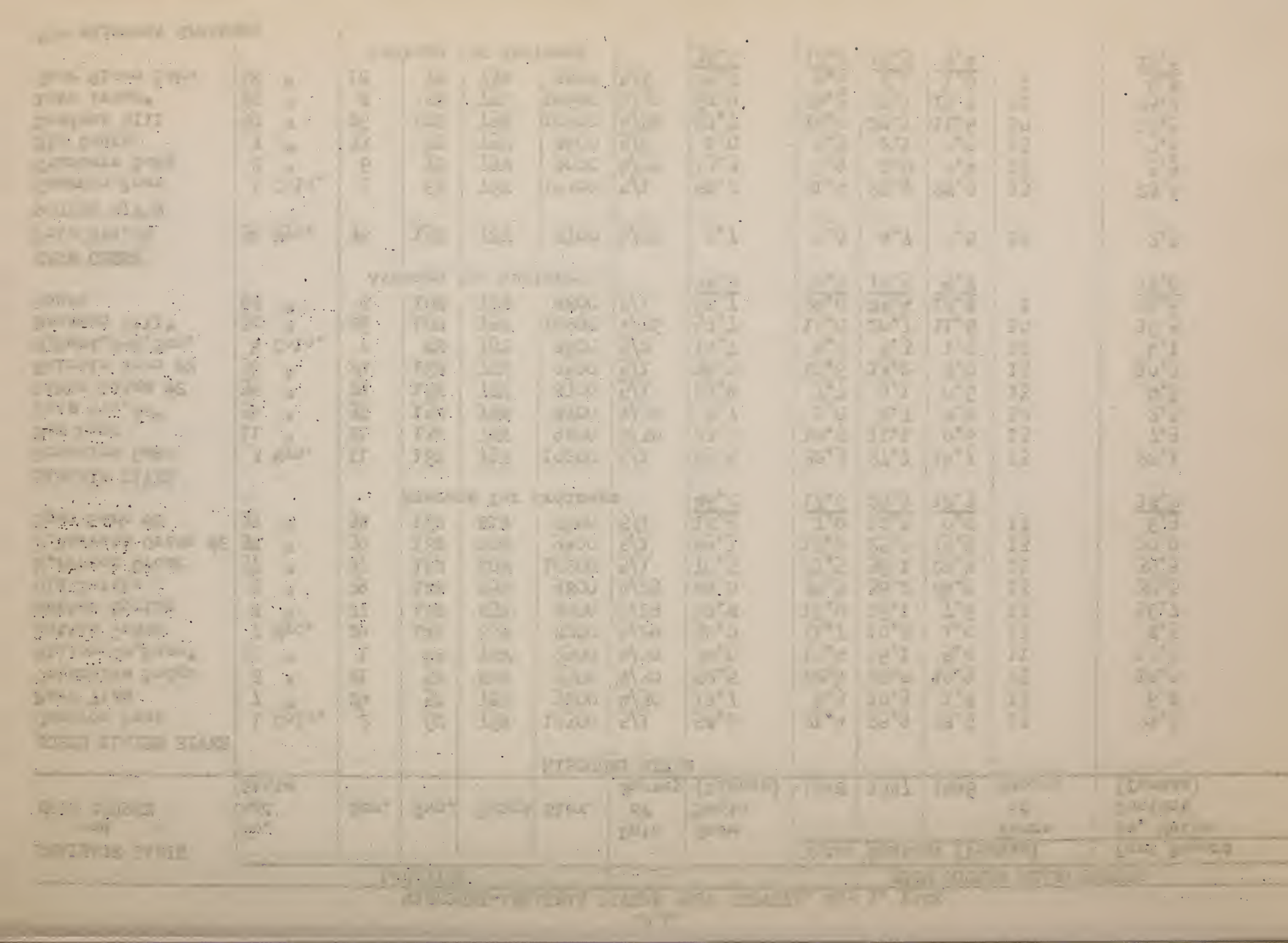
DRAINAGE BASIN and SNOW COURSE	LOCATION No. and State	Sec.	Twp.	Range	Elev.	Date of Survey	SNOW COURSE MEASUREMENTS Snow Depth (Inches)	Water Content (Inches) 1948	1947	1946	Past Record Years of Record	Av. Water Content (Inches)
						MISSOURI RIVER						
SHOSHONE RIVER												
Sylvan Pass	32 Wyo.	12	52N	110W	7100	5/1	39.7	14.1	13.8	4.0	12	8.1
Brooks Lake #2*	50 "	23	44N	110W	9200	4/30	65.0	25.7	28.4	13.4	13	21.3
			Average for drainage				52.4	19.9	21.1	8.7		14.7
BIG HORN RIVER												
Tensleep R.S.	13 Wyo.	30	49N	86W	8300	5/1	15.2	5.5	7.4	0.6	13	4.2
Ranger Creek	16 "	32	53N	88W	8800	4/30	26.0	6.4	6.0	2.7	13	6.5
Sawmill Glade	45 "	3	31N	101W	8500	4/30	15.7	6.3	5.6	0.0	9	6.1
Blue Ridge	46 "	23	31N	101W	9500	4/30	34.3	13.4	12.7	3.3	9	11.5
South Pass	47 "	13	30N	101W	9000	4/29	36.2	14.2	14.7	3.6	9	12.2
Wood River	48 "	28	46N	103W	8000	4/27	16.0	5.8	5.5	0.7	8	3.6
Sheridan Cr.R.S.	49 "	3	42N	109W	7500	4/30	11.0	2.3	3.0	---	10	1.1
Brooks Lake #3	50 "	23	44N	110W	9200	4/30	65.0	25.7	28.4	13.4	13	21.3
St.Lawrence R.S.	51 "	26	1N	4W	9000				5.7	--		
Mosquito Park R.S.	52 "	23	2S	3W	9500				7.7	1.8		
DuNoir	53 "	27	42N	108W	8760	4/29	24.9	6.4	10.9	1.0	8	6.4
T-Cross Ranch	54 "	1	43N	107W	8000	4/29	8.2	2.1	4.5	0.0	8	2.2
			Average for drainage				25.2	8.8	9.9	2.8		75.1
POWDER RIVER												
Red Fork	30 Wyo.	18	43N	85W	7500				10.0	0.0		
Sour Dough	31 "	17	49N	84W	8500	4/29	17.0	6.3	6.6	0.0	12	5.5
			Average for drainage									
TONGUE RIVER												
Big Goose Cr.R.S.	17 Wyo.	4	53N	86W	7700	4/30	12.5	3.9	4.5	0.0	13	3.1
SWEETWATER RIVER												
Grannier Meadows	29 Wyo.	19	30N	100W	9000	4/29	33.7	13.4	12.7	2.3	12	11.9
South Pass*	47 "	13	30N	101W	9000	4/29	36.2	14.2	14.7	3.6	8	12.2
			Average for drainage				35.0	13.8	13.7	3.0		12.0

*On Adjacent Drainage

MISSOURI-ARKANSAS RIVERS SNOW SURVEYS, May 1, 1948

DRAINAGE BASIN and SNOW COURSE	LOCATION					SNOW COURSE MEASUREMENTS						
								Water Content (Inches)				Past Record
	No. and State	Sec.	Twp.	Range	Elev.	Date of Survey	Snow Depth (Inches)	1948	1947	1946	Years of Record	Av. Water Content (Inches)
MISSOURI RIVER												
NORTH PLATTE RIVER												
Cameron Pass	1 Colo.	2	6N	76W	10300	5/1	58.2	21.4	25.9	28.5	13	23.6
Park View	7 "	24	5N	78W	9200	4/30	19.7	6.3	10.9	1.8	13	6.8
Columbine Lodge	8 "	21	5N	82W	9300	4/30	52.5	22.4	20.0	10.9	13	19.0
Willow Cr.Pass*	62 "	1	4N	78W	9500	4/30	34.0	10.4	16.1	5.0	11	12.2
Bottle Creek	7 Wyo.	24	14N	85W	8200	4/29	32.0	11.7	10.8	1.0	13	8.5
Webber Spring	8 "	27	14N	85W	9000	4/29	42.8	16.0	16.1	7.6	13	16.7
Old Battle	9 "	29	14N	85W	9800	4/29	84.0	34.9	36.2	24.9	13	32.5
N.French Creek	37 "	27	16N	80W	10200	5/1	70.5	27.5	36.1	29.4	11	32.5
N.Barrett Creek #2	38 "	30	16N	80W	9400	5/1	49.3	18.9	25.2	13.9	13	20.9
Ryan Park #2	39 "	34	16N	81W	8400	5/1	18.9	7.0	12.5	0.0	13	6.9
		Average for drainage					46.2	17.6	20.9	12.3		18.0
LARAMIE RIVER												
Brooklyn Lake	3 Wyo.	11	16N	79W	10200	5/1	59.5	22.3	27.7	14.7	13	22.1
Fox Park	11 "	21	13N	78W	9200	4/30	23.2	10.5	11.1	0.6	13	7.9
Pole Mtn.#2*	34 "	35	15N	72W	8700	4/30	2.7	1.0	4.7	0.0	12	2.5
Libby Lodge #2	35 "	29	16N	78W	8700	5/1	23.4	7.7	9.1	0.6	13	4.6
Hairpin Turn #2	36 "	24	16N	79W	9500	5/1	36.3	12.6	13.2	5.0	13	10.3
W.Port.G-P.Tun.	4 Colo.	7	8N	75W	8600	5/2	14.7	4.6	6.3	1.0	12	4.1
Deadman Hill*	50 "	26	10N	75W	10200	4/26	57.7	16.0	20.7	11.6	10	16.5
Roach	88 "	5	10N	77W	9800	5/1	65.7	24.0	23.4	12.8	8	19.6
		Average for drainage					35.4	12.3	14.5	5.8		11.0
CROW CREEK												
Pole Mtn.#2	34 Wyo.	35	15N	72W	8700	4/30	2.7	1.0	4.7	0.0	12	2.5
POUDRE RIVER												
Cameron Pass	1 Colo.	2	6N	76W	10300	5/1	58.2	21.4	25.9	28.5	13	23.6
Chambers Lake	2 "	6	7N	75W	9000	4/30	13.3	4.9	8.0	0.4	13	3.9
Big South	3 "	33	8N	75W	8600	5/2	1.0	0.3	2.1	0.0	13	0.6
Deadman Hill	50 "	26	10N	75W	10200	4/26	57.7	16.0	20.7	11.6	10	16.5
Lake Irene*	65 "	8	5N	75W	10600	4/30	63.9	24.2	27.1	15.2	11	23.4
Hour Glass Lake	68 "	18	7N	73W	9500	5/1	25.8	6.6	8.3	1.0	9	6.8
		Average for drainage					36.6	12.2	15.3	9.4		12.5

*On adjacent drainage



MISSOURI--ARKANSAS RIVERS SNOW SURVEYS, May 1, 1948

DRAINAGE BASIN and SNOW COURSE	LOCATION						SNOW COURSE MEASUREMENTS				
								Water Content (Inches)			Past Record
	No. and State	Sec.	Twp.	Range	Elev.	Date of Survey	Snow Depth (Inches)	1948	1947	1946	Years of Record	Av. Water Content (Inches)
MISSOURI RIVER												
BIG THOMPSON RIVER												
Lake Irene*	65 Colo.	8	5N	75W	10600	4/30	63.9	24.2	27.1	15.2	11	23.4
Hidden Valley #2	95 "	23	5N	74W	9550	5/1	41.3	12.7	16.1	5.4	8	12.7
			Average for drainage				52.6	18.4	21.6	10.3		18.0
ST. VRAIN RIVER												
Wild Basin	41 Colo.	24	3N	74W	10000	4/30	36.1	12.1	15.6	4.7	13	13.2
BOULDER CREEK												
E. Port. Moffat T.	5 Colo.	2	2S	74W	9400	4/30	2.0	0.8	2.8	0.0	13	1.7
University Camp#2	60 "	28	1N	73W	10300	4/29	62.2	25.4	27.4	17.2	11	21.8
			Average for drainage				32.1	13.1	15.1	8.6		11.6
CLEAR CREEK												
Loveland Pass #2	61 Colo.	37	4S	76W	10100	5/4	37.0	14.6	19.5	3.4	13	13.1
Grizzly Peak*	97 "	2	5S	76W	11250	4/28	62.0	20.5	23.0	11.9	7	18.5
			Average for drainage				49.5	17.6	21.2	7.6		15.8
SOUTH PLATTE RIVER (Above Denver)												
Hoosier Pass	14 Colo.	13	8S	78W	11400	4/30	41.5	14.0	14.1	5.1	13	11.1
Fairplay	15 "	33	9S	77W	10000	4/30	0.0	0.0	0.0	0.0	13	0.1
Jefferson Cr.#2	83 "	14	7S	76W	10100	4/30	30.7	9.2	11.4	2.3	12	5.2
			Average for drainage				24.1	7.7	8.5	2.5		5.5
ARKANSAS RIVER												
ARKANSAS RIVER												
Tennessee Pass	19 Colo.	21	8S	80W	10200	4/30	24.1	9.3	8.6	0.0	13	5.1
Twin Lakes T.	21 "	22	11S	82W	10500	4/30	34.5	11.3	14.1	—	12	9.0
Marshall Cr.*	42 "	24	48N	6E	10800	5/2	37.4	12.3	12.1	1.9	13	10.4
Poncha Cr.	43 "	19	48N	7E	10500	5/2	35.4	11.7	11.1	1.3	13	8.6
Whiskey Cr.#2	72 "		37.2N	105.2W	10300	4/30	5.5	2.0	4.6	0.0	11	5.0
La Veta Pass #2*	74 "	22	28S	70W	9300	4/29	9.3	3.1	5.0	0.0	13	4.2
Four Mile Park #2	78 "	23	11S	81W	9700	4/30	4.0	1.4	0.0	0.0	11	0.4
Fremont Pass #2*	79 "	2	8S	79W	11400	4/29	61.4	20.7	22.0	13.0	13	17.1
Blue Lakes	81 "	30	31S	69W	10000	4/30	12.9	4.7	11.7	0.0	11	7.5
Monarch Pass	92 "	16	49N	6E	10500	4/29	55.3	21.0	20.5	9.6	8	19.1
Glen Cove	103 "	26	13S	69W	10800	4/29	25.6	7.9	—	—	1	—
*On adjacent drainage			Average for drainage				28.0	9.7	11.0	2.9		8.6

The following organizations cooperate in the snow surveys and irrigation water supply forecasts for the Colorado, Missouri-Arkansas and Rio Grande watersheds by furnishing funds or services.

STATE
- Colorado State Engineer
- Wyoming State Engineer
- Utah State Engineer
- New Mexico State Engineer
- Montana State Engineer
- Nebraska State Engineer
- Colorado Experiment Station
- Colorado Extension Service
- Montana Experiment Station
- Utah Experiment Station

FEDERAL
- Department of Agriculture
  - Forest Service
  - Soil Conservation Service
- Department of Interior
  - Bureau of Reclamation
  - Geological Survey
  - National Park Service
- Department of Commerce
  - Weather Bureau
- War Department
  - Army Engineer Corps

PUBLIC UTILITIES
- Colorado Public Service Company
- Western Colorado Power Company
- Montana Power Company
- Public Service Company of New Mexico
- Denver and Rio Grande Western R. R. Company

MUNICIPALITIES
- City of Bozeman
- City of Denver
- City of Boulder

WATER USERS ORGANIZATIONS
- Poudre Valley Water Users' Association
- Arkansas Valley Ditch Association
- Colorado River Water Conservation District

IRRIGATION PROJECTS
- Farmers Reservoir and Irrigation Company
- San Luis Valley Irrigation District
- Santa Maria Reservoir Company
- Costilla Land Company
- Uncompahgre Valley Water Users' Association
- Wyoming Development Company
- Goshen Irrigation District
- Kendrick Project
- Pathfinder Irrigation District
- Salt River Valley Water Users' Association
- San Carlos Irrigation and Drainage District
- Twin Lakes Reservoir and Canal Company

Many other organizations and individuals furnish valuable information for the snow survey reports. Their cooperation is gratefully acknowledged.